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Attachment C

(request dated 28, 2000)

**PRELIMINARY WASTE DISPOSAL
FACILITIES DESIGN REPORT
APEX MINE**

**Prepared for:
Hecla Mining Company
Apex Unit
P.O. Box 2407
Old Highway No. 91
15 Miles West of St. George, Utah 84770**

**Prepared by:
Steffen Robertson and Kirsten (U.S.), Inc.
3232 South Vance Street
Lakewood, Colorado 80227**

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and consolidation has been affected by the waste chemistry and the quantity of solutions contained in the ponds. As a result, the ratio of solution to solid has varied over time, as well as has the concentrations of various constituents within the wastes.

During the previous mine closure, the solutions and solids contained in the plant were placed in the containment ponds. Hecla Mining Company, upon reopening of the facility, made the commitment to retreat the solutions and solids, upgrade the existing disposal ponds, and encapsulate the redeposited and treated waste. In order to investigate and to select viable treatment programs and processes, a physical and chemical characterization of the existing waste was conducted.

4.3.2 Quantities of Existing Wastes

The previous mine closure resulted in deposition of wastes in eight containment Ponds; 1B, 1C, 2, 2A, 3A, 3B North and South, and the Surge Pond (Figure 9). Approximate waste quantities and waste type, solid or liquid, as of April 14, 1989 are given on Table 3.

During the summer of 1989, waste from pond 3A was transferred into Ponds 3B North and South, waste from the Surge Pond was transferred into Pond 2, and waste from Pond 1B was also transferred into Pond 3BN. The existing liners were removed from the emptied ponds and co-disposed with the process wastes. The foundation materials beneath each removed pond liner were tested for contamination.

A limited amount of soil beneath pond 3A was excavated and codisposed with the process wastes. Pond 3A was then relined with a double liner and leak detection system as presented in Section 6.2.3. The berm between Ponds 1A and 1B

TABLE 3
EXISTING WASTE QUANTITIES (SPRING 1989)

Pond	Approximate Waste Quantity (yd ³)	Waste Description
1A	0	Un-Lined
1B	500	Wet Crystals
1C	3,000	Wet Crystals
2	21,000	Dark Liquid ¹
2A	7,500	Dark Liquid ¹
3A	14,000	Brown Crystalline Sludge
3B North	4,000	Wet Crystals
3B South	4,000	Wet Crystals
Surge	1,000	Dark Liquid ¹

¹Waste solution has the same appearance.

was removed to create one large pond, Pond 1A/B, which was relined with the double liner system.

In October 1989 the distribution of waste quantities by pond was resurveyed as given in Table 4.

4.3.3 Chemical Characteristics of Existing Waste

Samples of the solutions and solids contained in the various disposal ponds were collected on several occasions during 1988 and 1989 and submitted for geochemical analyses. The test results, presented on Tables 5 and 6, varied somewhat due to changes in solution concentrations and the ratio of solids to liquids which have varied over time. The actual analytical data sheets are contained in Appendix E.

In general, the wastes can be described as having low pH and elevated levels of arsenic, copper, iron, and zinc; and moderate levels of cadmium, lead, nickel, chromium, cobalt, manganese, and molybdenum. Low or non-detectable levels of barium, selenium, silver, and mercury were found.

4.4 Process Wastes TO BE REVISED

4.4.1 General

The beneficiation process involves crushing and leaching of the ore and extraction and precipitation of the leachate to produce concentrates of gallium and germanium, zinc, copper, and silver. A generalized schematic of the process is shown in Figure ____.

The processing plant is designed to operate at a rate of 100 tpd and is scheduled to be operated for 240 days per year. Two waste products result from the process. These are a leach

TABLE 4
DISTRIBUTION OF EXISTING WASTE (FALL 1989)

Pond	Waste Volume (yd ³)
1C	6,040
2	40,100
2A	3,500
3BN	2,700
3BS	2,200

Note: Refer to Figure 9 for pond designations.

TABLE 5
SUMMARY OF THE NOVEMBER 1988 WASTE CHARACTERIZATION

Parameter ¹	Pond							Surge Pond
	1B	1C	2	2A	3A	3BN	3BS	
pH	4.37	0.24	0.95	1.23	1.48	1.70	1.14	0.01
Arsenic	3.05	11,800	720	263	218	32.5	53.5	3,350
Barium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cadmium	1.05	221	19.8	3.78	2.59	0.95	4.43	22.6
Chromium	<0.2	3.3	7.4	7.6	37.0	12.1	40.5	1.5
Copper	0.51	8,210	1,170	334	97.6	6.05	4.48	3,190
Lead	<1.0	63.0	5.0	4.0	1.0	<1.0	0.08	3.0
Mercury	<0.005	0.027	<0.005	<0.005	<0.005	<0.005	<0.005	0.027
Selenium	<0.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Silver	<0.05	0.06	0.10	<0.05	<0.05	<0.05	<0.05	0.07
Total Organic Carbon	16.0	140	490	150	210	<69.0	190	190

¹ All analyses reported as total metals in mg/L, except pH.

TABLE 6
SUMMARY OF JULY 1989 WASTE CHARACTERIZATION

Pond Sample Identification	Parameter ^{1, 2}										
	Fe	Ag	Cu	Ni	Mg	Ca	Pb	Zn	Na	Hg	As
3BS-1 liquid	53,000	0.25	12.1	820	12,800	32	2.6	10,250	53,000	0.007	89
3BN-1 liquid	48,000	0.26	9.0	172.8	11,300	26	2.8	9,360	33,000	0.003	220
1C-1 liquid	11,900	0.36	11,670	39.4	2,600	2.2	100.0	34,200	134,000	0.011	42,400
2-1 liquid	58,000	0.58	3,620	176.0	11,100	26	12.5	9 790	34,000	0.007	1,700
2A-1 liquid	48,000	0.24	770	104.6	5,500	36	7.0	4,770	17,000	0.002	480
Surge-1 slurry	6,000	0.30	7,610	1,289	1,500	1.7	2.7	3,210	12,000	0.005	12,000
3A slurry-1	58,000	0.22	151	99	3,100	49	1.9	3,060	4,970	0.001	98
3BS slurry-1	59,000	0.22	18.2	142.3	4,700	72	1.9	4,540	3,410	0.001	4.2
3BN slurry-1	69,000	0.26	69	102	5,200	123	2.3	3,700	1,560	0.001	11.0
1C slurry-1	1,700	0.32	3,020	18	270	63	60	4,500	100,000	0.009	2,100
1B slurry-1	239	BLD	2.6	12	100	422	1.1	2,930	11,000	0.0005	0.38

Pond Sample Identification	Parameter							
	Chloride	COD	Nitrate-N	Nitrite-N	Cd	Cr	Mn	Se
3BS-1 liquid	1,325	5,800	2.0	6.0	9	72.0	540	>0.02
3BN-1 liquid	2,873	6,300	26	4.0	10.7	85.0	540	0.02
1C-1 liquid	182,300	5,200	72	>2.0	440	7.0	147	0.20
2-1 liquid	11,220	8,700	7.0	8.0	58.99	17.0	13.2	0.28
2A-1 liquid	6.0	6,500	2	2	8.9	19.0	150	0.06
Surge-1 slurry	2,944	2,400	<2	<1	65.6	31.0	31.0	<0.002
3A slurry-1	1,094	7,000	<2	<2	4.4	22.0	170	0.120
3BS slurry-1	108	2,800	<2	3	1.7	5.0	74.0	<0.02
3BN slurry-1	395	6,300	<0.02	3	4.5	6.0	103	<0.2
1C slurry-1	40	600	<2	<1	174	1.1	16	<0.02
1B slurry-1	2,142	2,400	17.0	<1	1,085	<0.05	4.0	<0.2

¹ All values are total analyses expressed in mg/L.

² BLD is below the detection limit of the Apex Mine Analytical Laboratory.

TABLE 4-1
EXISTING AND PROPOSED POND
CONFIGURATIONS AND CAPACITIES

Pond	Existing Waste (10 ⁶ ft ³)	Area (acres)	Existing Capacity (10 ⁶ ft ³)	Proposed Capacity (10 ⁶ ft ³)
1A/1B	0	2.3	1.1	1.1
1C	0.163	1.2	0.4	0
2	1.083	5.0	2.8	4.8
2A	0.095	2.8	2.4	2.4
3A	0	5.5	2.6	2.6
3BN	0.072	2.1	0.4	1.0
3BS	0.059	2.1	0.4	1.0
4A	0	3.8	0	1.4
4B	0	3.5	0	1.1
5	0	3.2	0	1.2